



DCR3480B52

Phase Control Thyristor Preliminary Information

DS5822-1.2 June 2005 (LN23991)

FEATURES

- Double Side Cooling
- High Surge Capability

KEY PARAMETERS

V_{DRM}	5200V
$I_{T(AV)}$	3430A
I_{TSM}	49000A
dV/dt^*	1500V/ μs
dI/dt	400A/ μs

APPLICATIONS

- High Power Drives
- High Voltage Power Supplies
- Static Switches

* Higher dV/dt selections available

VOLTAGE RATINGS

Part and Ordering Number	Repetitive Peak Voltages V_{DRM} and V_{RRM} V	Conditions
DCR3480B52	5200	$T_{vj} = -40^{\circ}C$ to $125^{\circ}C$, $I_{DRM} = I_{RRM} = 300mA$, $V_{DRM}, V_{RRM} t_p = 10ms$, $V_{DSM} \& V_{RSM} =$ $V_{DRM} \& V_{RRM} + 100V$ respectively
DCR3480B50	5000	
DCR3480B48	4800	
DCR3480B46	4600	

Lower voltage grades available.

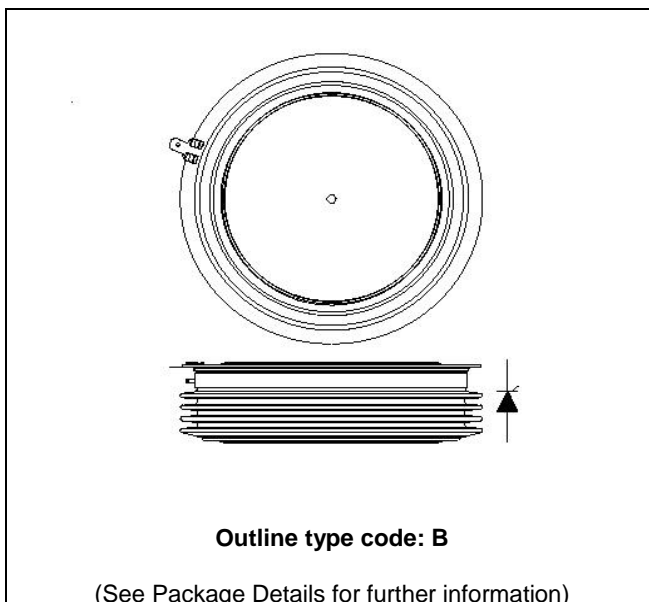


Fig. 1 Package outline

ORDERING INFORMATION

When ordering, select the required part number shown in the Voltage Ratings selection table.

For example:

DCR3480B52

Note: Please use the complete part number when ordering and quote this number in any future correspondence relating to your order.

CURRENT RATINGS

$T_{case} = 60^{\circ}C$ unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
Double Side Cooled				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	3430	A
$I_{T(RMS)}$	RMS value	-	5388	A
I_T	Continuous (direct) on-state current	-	4890	A

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}C$	49.0	kA
I^2t	I^2t for fusing	$V_R = 0$	12.0	MA ² s

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions		Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance – junction to case	Double side cooled	DC	-	0.007	$^{\circ}C/W$
		Single side cooled	Anode DC	-	0.0116	$^{\circ}C/W$
			Cathode DC	-	0.0181	$^{\circ}C/W$
$R_{th(c-h)}$	Thermal resistance – case to heatsink	Clamping force 76kN (with mounting compound)	Double side	-	0.0014	$^{\circ}C/W$
			Single side	-	0.0028	$^{\circ}C/W$
T_{vj}	Virtual junction temperature	On-state (conducting)		-	135	$^{\circ}C$
		Reverse (blocking)		-	125	$^{\circ}C$
T_{stg}	Storage temperature range			-55	125	$^{\circ}C$
F_m	Clamping force			68.0	84.0	kN

DYNAMIC CHARACTERISTICS

Symbol	Parameter	Test Conditions		Min.	Max.	Units
I _{RRM} /I _{DRM}	Peak reverse and off-state current	At V _{RRM} /V _{DRM} , T _{case} = 125° C		-	300	mA
dV/dt	Max. linear rate of rise of off-state voltage	To 67% V _{DRM} , T _j = 125° C, gate open		-	1500	V/μs
dI/dt	Rate of rise of on-state current	From 67% V _{DRM} to 2x I _{T(AV)}	Repetitive 50Hz	-	200	A/μs
		Gate source 30V, 10Ω, t _r < 0.5μs, T _j = 125° C	Non-repetitive	-	400	A/μs
V _{T(TO)}	Threshold voltage – Low level	500A to 2400A at T _{case} = 125° C		-	0.86	V
	Threshold voltage – High level	2400A to 7200A at T _{case} = 125° C		-	0.98	V
r _T	On-state slope resistance – Low level	500A to 2400A at T _{case} = 125° C		-	0.2533	mΩ
	On-state slope resistance – High level	2400A to 7200A at T _{case} = 125° C		-	0.1886	mΩ
t _{gd}	Delay time	V _D = 67% V _{DRM} , gate source 30V, 10Ω t _r = 0.5μs, T _j = 25° C		TBD	TBD	μs
t _q	Turn-off time	T _j = 125° C, V _R = 200V, dI/dt = 1A/μs, dV _{DR} /dt = 20V/μs linear		400	750	μs
Q _S	Stored charge	I _T = 2000A, T _j = 125° C, dI/dt – 1A/μs,		2200	5500	μC
I _L	Latching current	T _j = 25° C, V _b = 5V		TBD	TBD	mA
I _H	Holding current	T _j = 25° C, R _{G-K} = ∞, I _{TM} = 500A, I _T = 5A		TBD	TBD	mA

GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
V_{GT}	Gate trigger voltage	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	1.5	V
V_{GD}	Gate non-trigger voltage	At $V_{DRM}, T_{case} = 125^{\circ}C$	TBD	V
I_{GT}	Gate trigger current	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	250	mA
I_{GD}	Gate non-trigger current	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	TBD	mA

CURVES

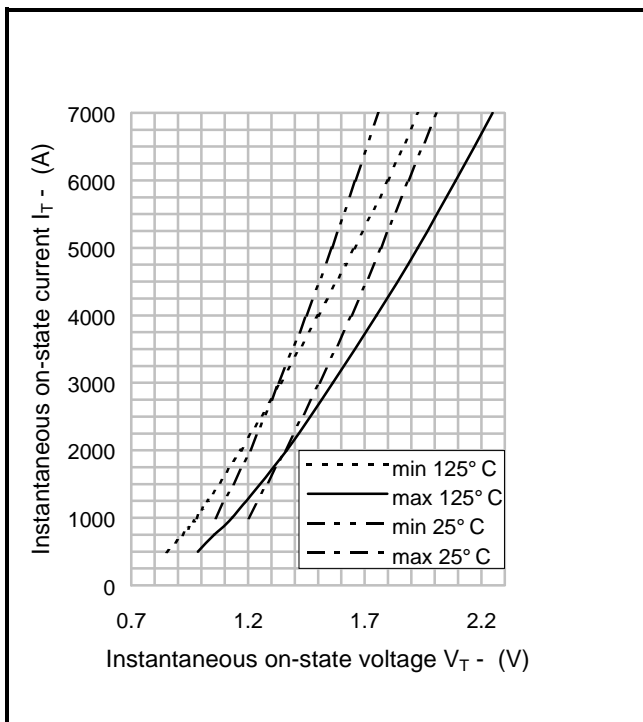


Fig.2 Maximum & minimum on-state characteristics

V_{TM} EQUATION

$$V_{TM} = A + B \ln(I_T) + C \cdot I_T + D \cdot \sqrt{I_T}$$

Where $A = 0.722818$

$B = -0.002455$

$C = 0.000096$

$D = 0.010486$

these values are valid for $T_j = 125^{\circ}C$ for I_T 100A to 7000A

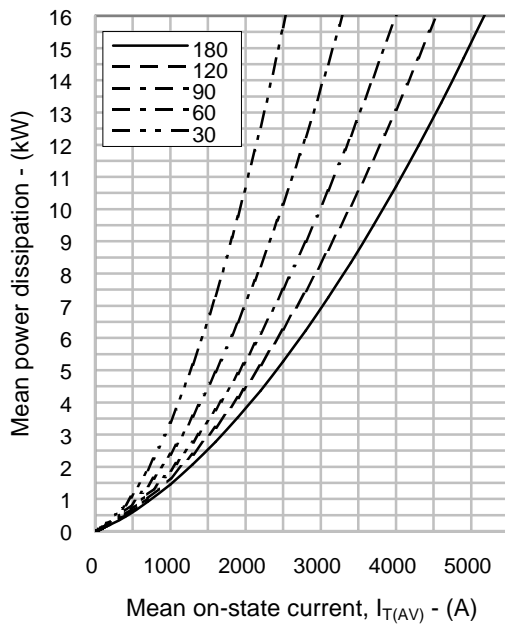


Fig.3 On-state power dissipation – sine wave

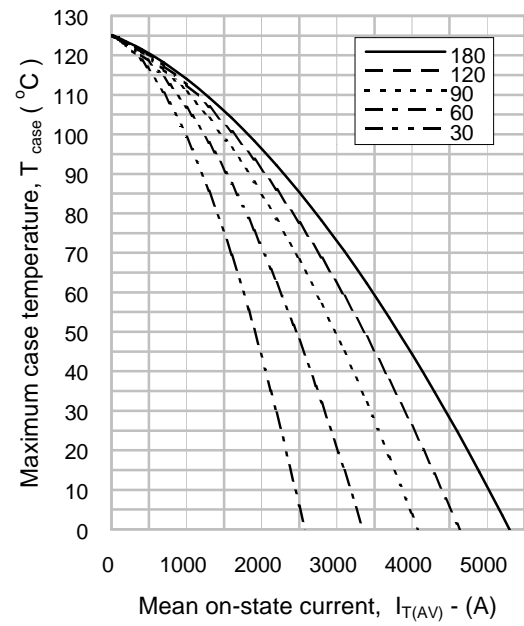


Fig.4 Maximum permissible case temperature, double side cooled – sine wave

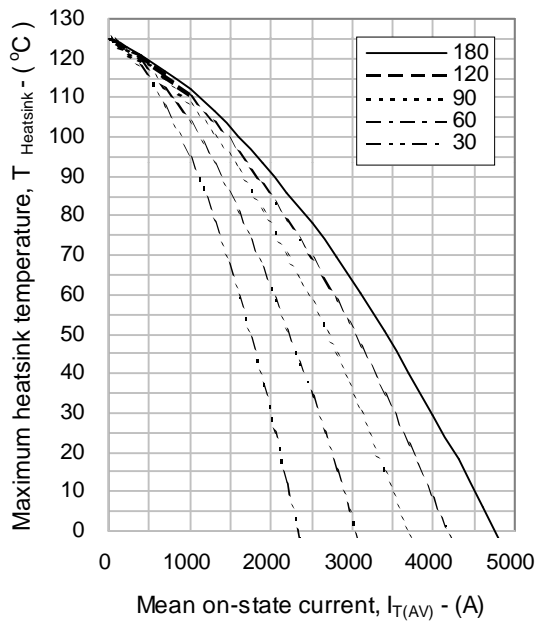


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

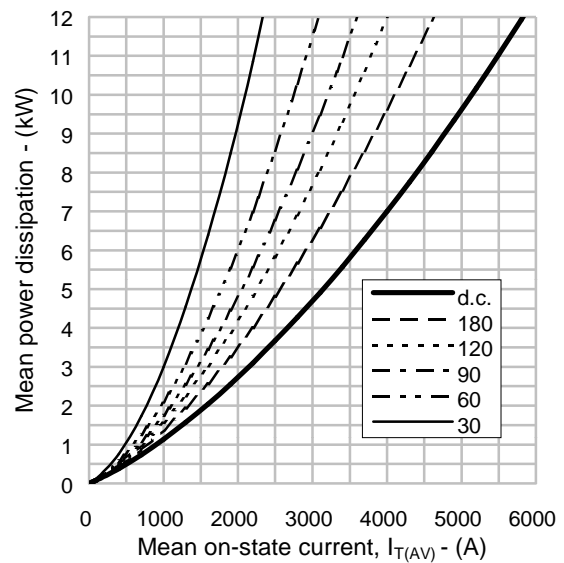


Fig.6 On-state power dissipation – rectangular wave

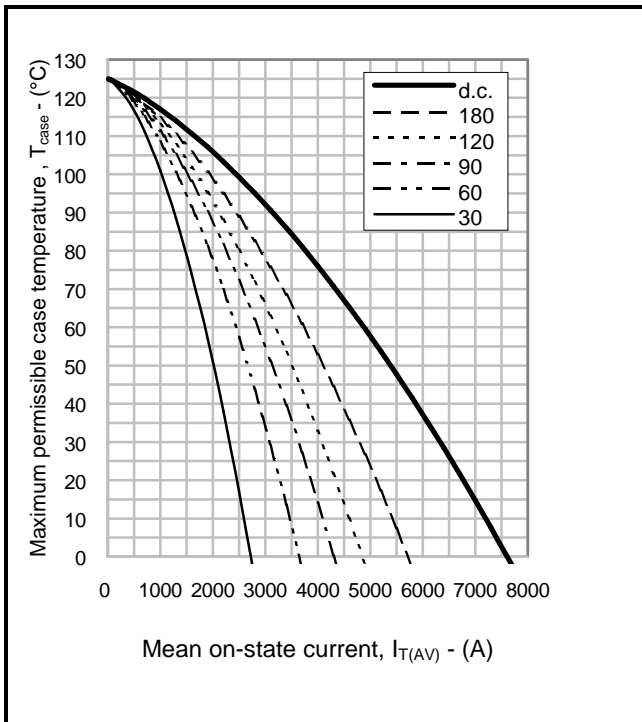


Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave

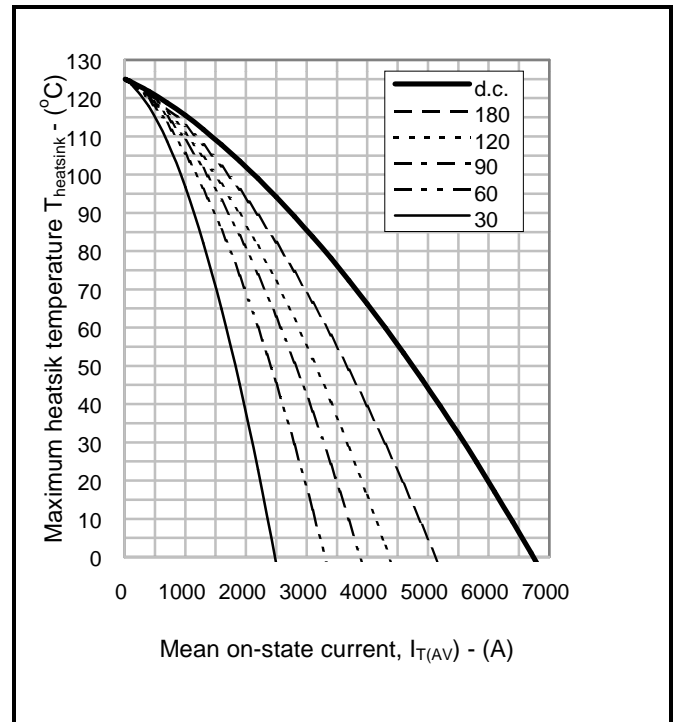


Fig.8 Maximum permissible heatsink temperature, double side cooled – rectangular wave

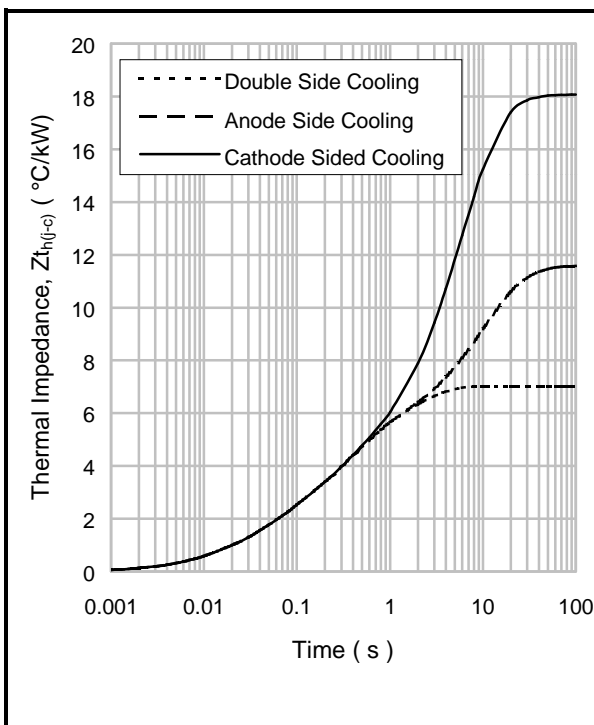


Fig.9 Maximum (limit) transient thermal impedance – junction to case (°C/kW)

		1	2	3	4
Double side cooled	R_{θ} (°C/kW)	0.502	1.333	2.9559	2.2335
	T_1 (s)	0.0137081	0.0548877	0.3311925	1.6905
Anode side cooled	R_{θ} (°C/kW)	1.3035	3.138	1.1859	5.9136
	T_1 (s)	0.0251065	0.2410256	1.0806	11.002
Cathode side cooled	R_{θ} (°C/kW)	1.2616	2.6216	13.3603	0.8304
	T_1 (s)	0.0245837	0.2005035	5.7854	16.765

$$Z_{th} = \sum [R_i \times (1 - \exp. (t/t_i))] \quad [1]$$

$\Delta R_{th(j-c)}$ Conduction

Tables show the increments of thermal resistance $R_{th(j-c)}$ when the device operates at conduction angles other than d.c.

Double side cooling		
θ°	sine.	rect.
180	0.70	0.48
120	0.80	0.68
90	0.90	0.78
60	1.00	0.89
30	1.07	1.01
15	1.10	1.07

Anode Side Cooling		
θ°	sine.	rect.
180	0.67	0.47
120	0.77	0.66
90	0.87	0.75
60	0.95	0.86
30	1.02	0.96
15	1.05	1.02

Cathode Sided Cooling		
θ°	sine.	rect.
180	0.67	0.47
120	0.77	0.66
90	0.87	0.76
60	0.95	0.86
30	1.02	0.96
15	1.05	1.02

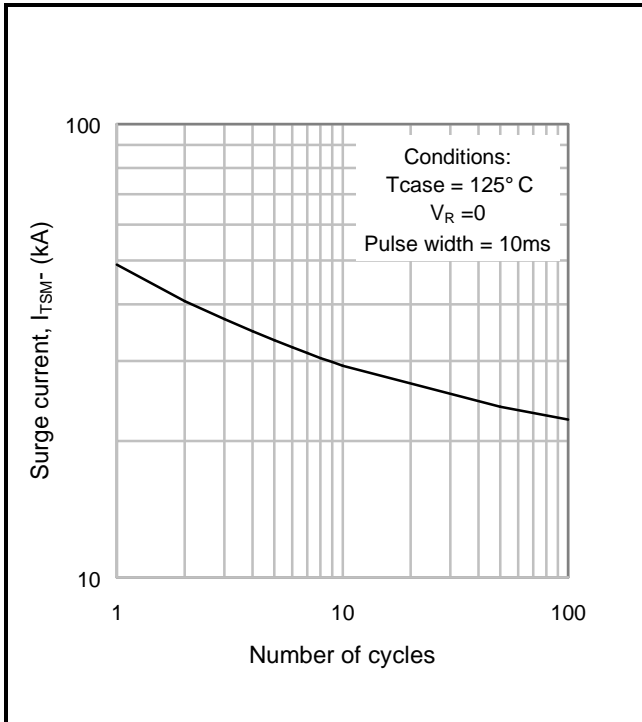


Fig.10 Multi-cycle surge current

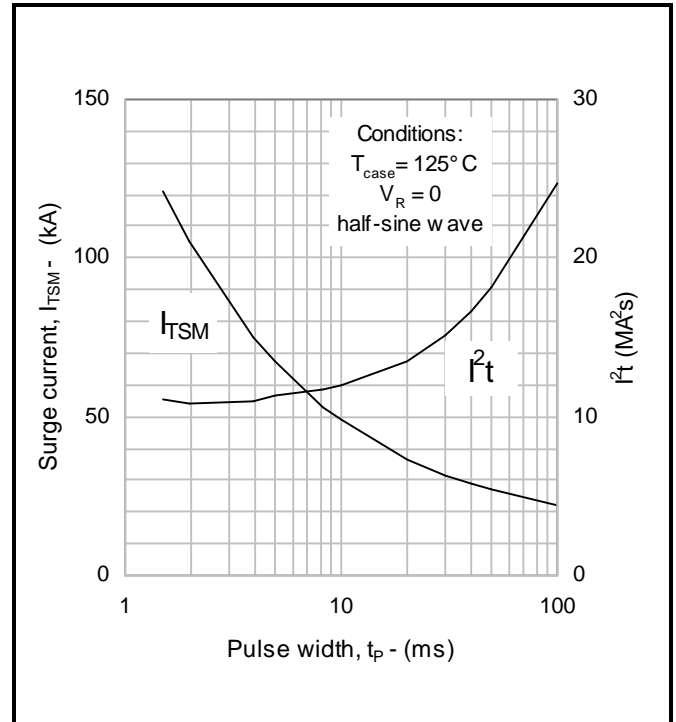


Fig.11 Single-cycle surge current

PACKAGE DETAILS

For further package information, please contact Customer Services. All dimensions in mm, unless stated otherwise. DO NOT SCALE.

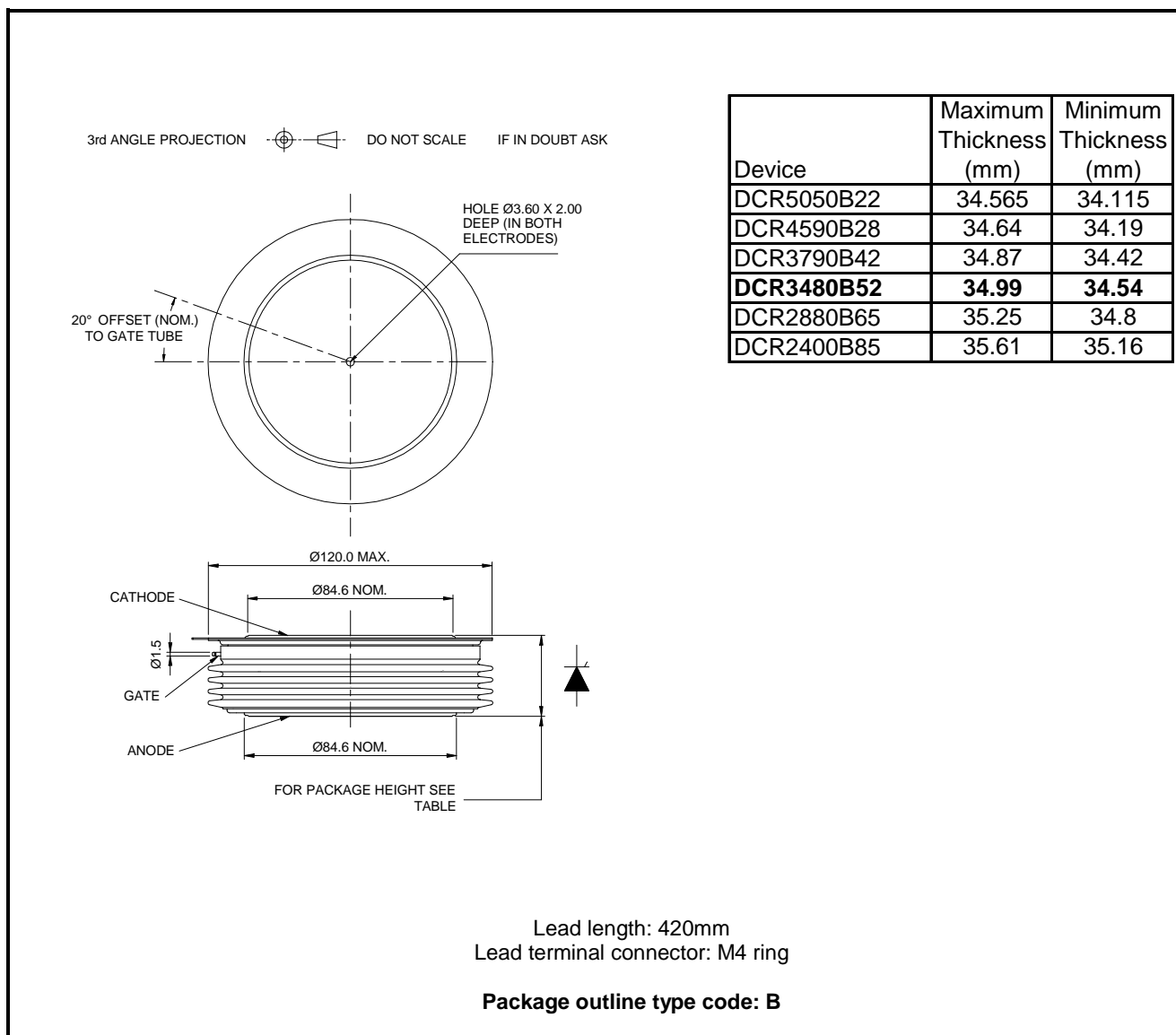


Fig.15 Package outline

POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink and clamping systems in line with advances in device voltages and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group offers high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the latest CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete Solution (PACs).

HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks which have been designed to optimise the performance of Dynex semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest sales representative or Customer Services.

Stresses above those listed in this data sheet may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed.



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